



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,157	09/28/2001	Richard D. Harris	01AB091	4953

7590 07/14/2003

Susan M. Donahue  
Rockwell Automation  
1201 South Second Street, 704P  
Milwaukee, WI 53204

EXAMINER

TRINH, MICHAEL MANH

ART UNIT PAPER NUMBER

2822

DATE MAILED: 07/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/967,157

Applicant(s)

HARRIS ET AL.

Examiner

Michael Trinh

Art Unit

2822

-- Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 11/19/02 & 4/15/03.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-14, 16-23, 25-32, 34-48 and 51-102 is/are pending in the application.
- 4a) Of the above claim(s) 7-9, 29-32, 34-48, 51, 52, 59-61 and 81-102 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 10-14, 16-23, 25-28, 53-58, and 62-80 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

Art Unit: 2822

## **DETAILED ACTION**

\*\*\* This office action is in response to Applicant's amendment filed on November 19, 2002 and election filed on April 15, 2003. Claims 15,24,33, and 49-50 were cancelled. Claims 1-14, 16-23, 25-32, 34-48, and 51-102 are pending.

\*\*\* The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Election/Restrictions***

1. Applicant's election filed April 15, 2003 of Group I, method claims 1-6,10-28, 53-58, and 62-80 in Paper No. 10, without traverse, is acknowledged. Claims 15,24,33, and 49-50 were previously cancelled by Applicant. Accordingly, claims 7-9,29-32,34-48,51-52,59-61, and 81-102 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, wherein claims 60-61 are grouped into group IV. There being no allowable generic or linking claim.

### ***Claim Rejections - 35 USC § 112***

2. Claims 1-6,10-14, and 53-58 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for forming a wafer having a pair of spacers defining a recess/void therebetween so that attaching the wafer to a substrate would form a composite structure having an internal void, as shown in Figures 2-5, but does not reasonably provide enablement for merely attaching a wafer having a removed portion of the first layer through a second layer as recited in claim 1 so that at least one wall of the substrate defines the void. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims, since by attaching the wafer to the substrate, the first layer on the wafer is directly attached to the substrate so that there is no formation of void. As shown in Figure 4, it is essential and necessary to remove a portion of a layer 31 so that the internal void can be formed.

(Dependent claims are rejected as depending on rejected base claim)

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1, 16, 19, 25, and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Greywall (6,356,689).

Greywall teaches a method comprising the steps of: (a) providing a silicon wafer (202) with first and second members comprising at least a first layer (204d) and a second layer (206d) as; (b) removing a portion of the first layer to form a bridge member (420, 720) (column 10, lines 34-44; figures 4a-4h, 7i; columns 6-7), wherein a pair of spacers defining a recess therebetween the first and second layers; (c) after step (b), attaching the wafer to the upper surface of a substrate to form a composite structure having an internal void formed therein (fig. 7I; column 10, lines 45-50), wherein the bridge member (720) is aligned with the internal void (fig. 7i; column 10, lines 50-51), wherein as clearly shown in Figure 4G, the substrate including the film 410 provides defining at least one wall defining the void; (d) and etching through the upper layer wafer around the periphery of the bridge member (720) to break through the recess, thereby releasing the bridge from mechanical communication with the substrate (column 10, lines 52-56). Re further claim 25, wherein the bridge member (420, 720) is silicon.

5. Claims 1-6, 10-11, 14, 16, 19-21, 23, 25-28, 53-58, 62-63, 66-68, 71-73, 75-80 are rejected under 35 U.S.C. 102(e) as being anticipated by Black (4,426,768).

Black teaches a method comprising the steps of: (a) providing a silicon wafer 20 with first and second members comprising at least a first layer 30 and a second layer; (b) removing a portion of the first layer to form a bridge member 30 (figures 2, 8-10; column 3, lines 15-65; col 4), wherein a pair of spacers 38/36/34 defining a recess therebetween; (c) after step (b), attaching

Art Unit: 2822

the wafer to the upper surface of a substrate 40 (Fig 7) to form a composite structure (Fig 9) having an internal void formed therein (figs. 8-9; column 5, line 8 through col 6, line 40), wherein the bridge member 30 (Figs 9-10 is aligned with the internal void; (d) and etching through the upper layer wafer around the periphery of the bridge member 30 to break through the recess (Figs 10,9; col 5, line 23 through col 6, line 40), thereby releasing the bridge from mechanical communication with the substrate (Fig 10). Re claims 2-3,26-27,54-55,78-79, wherein a conductive layer of aluminum 36 is deposited onto the wafer (Figs 4-5; col 3, lines 64-68). Re claim 4, wherein the wafer 20 is silicon (col 2, lines 45-60). Re claims 5-6,28,56-58,80, wherein the substrate 40/41 is high resistivity silicon (col 4, lines 42-60). Re claims 10-11,20-21,62-63, 72-73, wherein the bridge member 30 as a second layer is silicon dioxide (col 3, lines 15-20). Re further claims 53 and 68,14, 66-67, 75-76, wherein a conductive member, as shown in figures 9 and 13, extends from the bridge 30 separated from a stationary member 22/23 by a variable size gap (Figs 9,13, and 10).

### *Claim Rejections - 35 USC § 103*

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 4-6 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greywall (6,356,689), as applied to claims 1 and 16 above, in view of Coldren et al (5,877,038).

Greywall discloses a method as applied above to claims 1 and 16 and fully incorporated herein.

Greywall lacks disclosing the substrate selected from the group of silicon, silicon carbide, ceramic, crystalline sapphire, gallium arsenide, glass, and high resistivity silicon, and the wafer selected from the group of silicon, silicon carbide, and gallium arsenide.

Coldren et al disclose the interchangeable use of substrates selected from the group of silicon, silicon carbide, ceramic, crystalline sapphire, gallium arsenide, glass, and high resistivity silicon, and the use of wafer selected from the group of silicon, silicon carbide, and gallium arsenide (column 3, lines 26-30).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the substrate selected from the group of materials as taught by Coldren in the method of Greywall, because these materials are alternative and art recognized equivalent materials for substitution, and are effective in bonding to another substrate or wafer for use as a support.

8. Claims 2-3 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greywall (6,356,689), as applied to claims 1 and 16 above, in view of Jacobsen et al (6,316,278).

Greywall discloses a method as applied above to claims 1 and 16 and fully incorporated herein.

Greywall lacks depositing and patterning of a conductive layer selected from a group consisting of aluminum, copper, silver, gold, and nickel.

Jacobsen et al teach depositing and patterning of a conductive layer selected from a group consisting of aluminum and gold (column 6, lines 39-41, 52-56; column 7, lines 14-25).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to deposit and pattern an aluminum, copper, or gold layer, as taught by Jacobsen et al, in the method of Greywall in order to provide an electrical connection between the mirrors and the electrical contact pad. It also would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute silver and nickel for the conductive layer, as these are alternative known materials for forming an conductive layer to be used as an electrical connection.

9. Claims 10, 11, and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greywall (6,356,689), as applied to claims 1 and 16 above, in view of Huibers (6,356,378).

Greywall discloses a method as applied above to claims 1 and 16 and fully incorporated herein.

Greywall lacks disclosing the bridge member comprising an insulating material of silicon dioxide.

Huibers discloses the bridge member comprising an insulating material of silicon dioxide (column 18, lines 10-14).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the bridge member of Greywall out of an insulating material of silicon dioxide as taught by Huibers, because the bridge member is just as effective when using the alternative materials including silicon dioxide.

10. Claims 12-13 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greywall (6,356,689), as applied to claims 1 and 16 above, in view of McNie et al (US2002/0017132).

Greywall discloses a method as applied above to claims 1 and 16 and fully incorporated herein.

Greywall lacks etching of an alignment hole into the wafer and thinning of the wafer such that the alignment hole extends entirely through.

McNie discloses etching an alignment hole (52, 54) into the wafer (paragraph 157) and thinning the substrate such that the alignment hole extends entirely through (paragraph 160).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Greywall by etching an alignment hole into the wafer, as taught by McNie, because the alignment hole would serve as alignment marker when forming the bridge member. It also would have been obvious to one of ordinary skill in the art at the time the invention was made to have modify the method of Greywall by thinning the substrate such that the alignment hole extends entirely through the substrate, as taught by

Art Unit: 2822

McNie, because the alignment hole would serve as an alignment marker for substrate processing of the substrate.

11. Claims 12-13,15,17-18,22,64-65,69-70, and 74 are rejected under 35 U.S.C. 102(e) as being anticipated by Black (4,426,768) in view of McNie (US2002/0017132).

Black teaches a method as applied to claims 1-6,10-11,14,16,19-21,23,25-28,53-58,62-63,66-68,71-73,75-80 above, and fully incorporated herein.

Black lacks etching of an alignment hole into the wafer and thinning of the wafer such that the alignment hole extends entirely through.

McNie discloses etching an alignment hole (52, 54) into the wafer (paragraph 157) and thinning the substrate such that the alignment hole extends entirely through (paragraph 160).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Black by etching an alignment hole into the wafer, as taught by McNie, because the alignment hole would serve as alignment marker when forming the bridge member. It also would have been obvious to one of ordinary skill in the art at the time the invention was made to have modify the method of Greywall by thinning the substrate such that the alignment hole extends entirely through the substrate, as taught by McNie, because the alignment hole would serve as an alignment marker for substrate processing of the substrate. It would have been obvious to one of ordinary skill in the art to employ other alternative known materials for the layers including silicon dioxide, silicon nitride, silicon, polysilicon, because the substitution of art recognized equivalent materials would have been obvious to one of ordinary skill in the art.

### ***Response to Arguments***

\*\*\* Applicant's arguments filed November 19, 2002 have been fully considered but they are not persuasive, and are also moot in view of the new ground(s) of rejection.

\*\* Applicant mainly remarked that Greywall does not teach the substrate provides at least one wall for defining the void.

In response, this is noted and found unconvincing. As clearly shown in Figure 4G, the substrate including the film 410 provides defining at least one wall defining the void.




Art Unit: 2822

\*\*\*\*\*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (703) 308-2554. The examiner can normally be reached on M-F from 8:30 Am to 4:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (703) 308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.  
Oacs-4



Michael Trinh  
Primary Examiner